

WHAT IS CLAIMED IS:

1 1. A window position detection and anti-pinch system for a
2 vehicle door assembly having a window adjustably positionable in a window frame
3 by a reversible motor operatively connected to the window, the system comprising:
4 at least one sensing device disposed adjacent the window for
5 detecting the position of the window relative to the window frame, the at least one
6 sensing device generating an output signal representative of the detected position of
7 the window; and
8 a controller responsive to the output of the at least one sensing device
9 for comparing the output signal against predetermined values to determine whether
10 an obstruction exists between the window and window frame.

1 2. The window position detection and anti-pinch system of claim
2 1 wherein the at least one sensing device comprises a first sensing device detecting
3 a coding arrangement provided on the window and generating an output
4 representative of the detected position of the indicia on the window.

1 3. The window position detection and anti-pinch system of claim
2 2 wherein the at least one sensing device comprises a first sensing device having a
3 sensor detecting a coding arrangement located on the window and a transmitter
4 generating an output representative of the detected position of the indicia on the
5 window.

1 4. The window position detection and anti-pinch system of claim
2 2 wherein the coding arrangement comprises a plurality of indicia uniformly spaced
3 and correlated to convey the vertical position of the window in the window frame
4 to the sensor.

1 5. The window position detection and anti-pinch system of claim
2 4 wherein the coding arrangement is etched into a surface of the window.

1 6. The window position detection and anti-pinch system of claim
2 4 wherein the coding arrangement is provided on a media applied to the window.

1 7. The window position detection and anti-pinch system of claim
2 1 wherein the at least one sensing device includes a first sensing device for detecting
3 the position of the window relative to the window frame and a second sensing
4 device for detecting the presence of an obstruction between the window and window
5 frame.

1 8. The window position detection and anti-pinch system of claim
2 7 wherein the second sensing device comprises a transmitter disposed adjacent an
3 upper rear portion of the window frame emitting an energy signal along the inner
4 periphery of the window frame, a receiver in communication with the controller
5 disposed adjacent a lower front portion of the window frame detecting the
6 electromagnetic signal and a prism positioned in the path of the energy signal
7 emitted by the transmitter and arranged to redirect the signal to the receiver.

1 9. The window position detection and anti-pinch system of claim
2 8 further comprising a shutter mechanism arranged to block the energy signal if an
3 obstruction contacts a lower end of the shutter mechanism.

1 10. The window position detection and anti-pinch system of claim
2 1 wherein the at least one sensing device comprises a rotary member engaging a
3 surface of the window and an encoder rotatably connected to the rotary member for
4 detecting the position of the window relative to the window frame, wherein the
5 encoder is rotated by the rotary member upon the movement of the window.

1 11. The window position detection and anti-pinch system of claim
2 10 wherein the at least one sensing device comprises an encoder having a plurality
3 of electrical contacts provided on an outer periphery of the encoder and at least one
4 electrical contact in communication with the controller for monitoring pulses
5 generated by the rotation of the plurality of contacts on the encoder upon the
6 movement of the window.

1 12. The window position detection and anti-pinch system of claim
2 10 wherein the at least one sensing device comprises an encoder having a multi-
3 poled magnet centrally disposed in the encoder and a receiver in communication
4 with the controller comprising a Hall effect sensor disposed radially outwardly of
5 the magnet for monitoring pulses generated by the rotation of the magnet on the
6 encoder.

1 13. The window position detection and anti-pinch system of claim
2 10 wherein the at least one sensing device comprises an encoder having a plurality
3 of intermittent holes positioned about the periphery of the encoder allowing an
4 electromagnetic signal to pass through and a photointerrupter in communication
5 with the controller positioned adjacent the encoder for monitoring pulses generated
6 by the interruption of the electromagnetic signal by the rotation of the encoder based
7 on the change in position of the window relative to the window frame.

1 14. The window position detection and anti-pinch system of claim
2 1 wherein the at least one sensing device comprises an infrared light sensing
3 arrangement.

1 15. A method of detecting the position of a window relative to a
2 window frame of a vehicle door assembly, the method comprising:
3 positioning at least one sensing device adjacent the window and
4 generating an output signal representative of the position of the window relative to
5 the window frame;
6 comparing the output signal generated by the at least one sensing
7 device against predetermined values to determine whether an obstruction exists
8 between the window and window frame; and
9 generating a control signal to stop and reverse the travel of the
10 window upon detection of an obstruction between the window and window frame.

1 16. The method of claim 15 wherein generating an output signal
2 comprises detecting a coding arrangement located on the window, wherein the

3 coding arrangement comprises a plurality of indicia uniformly spaced and correlated
4 to convey the vertical position of the window relative to the window frame.

1 17. The method of claim 15 further comprising positioning a
2 second sensing device to detect the presence of an obstruction between the window
3 and window frame.

1 18. The method of claim 17 wherein positioning the second
2 sensing device comprises providing a transmitter disposed adjacent an upper rear
3 portion of the window frame, emitting an energy signal along the inner periphery
4 of the window frame, and receiving the energy signal at a receiver disposed adjacent
5 a lower front portion of the window frame.

1 19. The method of claim 15 wherein positioning the at least one
2 sensing device further comprises providing a rotary member disposed adjacent the
3 window and an encoder rotatably connected to the rotary member for detecting the
4 position of the window relative to the window frame.

1 20. The method of claim 19 wherein providing an encoder
2 comprises providing an encoder having a plurality of electrical contacts provided
3 on an outer periphery of the encoder and at least one electrical contact in
4 communication with the controller for monitoring pulses generated by the rotation
5 of the plurality of contacts translated from a change in position of the window
6 relative to the window frame.

1 21. The method of claim 19 wherein providing an encoder
2 comprises providing an encoder having a multi-poled magnet centrally disposed in
3 the encoder and a receiver in communication with the controller comprising a Hall
4 effect sensor disposed radially outwardly of the magnet for monitoring pulses
5 generated by the rotation of the magnet on the encoder translated from a change in
6 position of the window relative to the window frame.

1 22. The method of claim 19 wherein providing an encoder
2 comprises providing an encoder having a plurality of intermittent holes positioned
3 about the periphery of the encoder allowing an electromagnetic signal to pass
4 through and a photointerrupter in communication with the controller positioned
5 adjacent the encoder for monitoring pulses generated by the interruption of the
6 electromagnetic signal by the rotation of the encoder based on the change in position
7 of the window relative to the window frame.